Math 1710

Sample Test 1 **Time: 55 minutes**

Name: **; ID#**

Read questions carefully and answer. Show all steps for full credit.

1. *(5 points each, total 25)* Find $\frac{dy}{dx}$ for (a)-(d):
   (a) $f(x) = (\frac{sinx}{1+cosx})^2$

   (b) $y^2 = x^2 + sin(xy)$

(c) $f(x) = x^2 sin^2(2x^2)$

(d) $x^2 + xy + y^2 - 5x = 2$

(e) Find $\frac{d^2y}{dx^2}$ for the function in (d)

2. *(15 points)* Water drains from the conical tank of height 10 ft. and base radius 4 ft. at the rate of $5ft^3/min$. How fast is the water level dropping when height is 6 ft?

3. *(5 each, total 15)* State the definition of inflection point and find the inflection point(s) for the following:
Definition of Inflection Point:

(a) $f(x) = 3x^5 - 20x^3$

(b) $f(x) = \sqrt{3x - 5}$

4. *(6+9+5)* For the function $f(x) = x^3 + \frac{3}{2}x^2 - 6x + 10$, answer following:
   (a) Find the critical point(s)

(b) Find the intervals where $f(x)$ is increasing and decreasing

(b) At what points, if any, does $f(x)$ assume local max and minimum values?

5. *(5 points each, total 25 points)* For the function $f(x) = x^2(6 - x^2) - 4$, answer following:
(a) Find the critical point(s)

(b) Find the inflection point(s)

(c) Find the intervals where $f(x)$ is concave up and concave down

(d) Find local maximum, minimum. Are any of them Abs. max or min?

(e) Sketch the graph